We claim:

1. In a digital signal receiver for a communication system, a method for processing a multi-dimensional digital signal received from a communication channel, the multidimensional signal including encoded data symbols, each encoded data symbol being represented by a number of sub-symbols in different dimensions of the multi-dimensional signal, the method comprising:

encoding each sub-symbol in the multidimensional signal by

extracting sufficient information associated with the sub-symbol for subsequent processing;

performing a pair-swap and symbol alignment operation on the

encoded multidimensional signal; and

decoding the pair-swap reordered and symbol aligned

multidimensional signal to produces data symbols represented

by the sub-symbols in an output signal.

2. A digital signal receiver for reordering a multi-dimensional signal received from a communication channel, the multidimensional signal

including encoded data symbols, each encoded data symbol being represented by a number of sub-symbols in different dimensions of the multi-dimensional signal, comprising:

a slicer configured to quantize the sub-symbols in the multidimensional digital signal to a quantized value;

an encoder operating in conjunction with the slicer unit and configured to encode each sub-symbol to include the quantized value and neighborhood information associated with the sub-symbol;

a pair-swap and symbol alignment module coupled to the slicer/encoder and configured to detect and correct pair-swap and symbol misalignment in the multidimensional digital digital; and

at least one decoder coupled to the pair-swap and symbol alignment module configured to receive the pair-swap reordered and symbol aligned multidimensional signal, to decode the sub-symbols in the multidimensional signal, to correct errors associated with these sub-symbols, and to produce decoded symbols represented by the sub-symbols in an output signal.

3. The digital receiver of claim 2, wherein the encoder operates to encode the quantized value and neighborhood information associated with each sub-symbol by extracting compact yet sufficient information for subsequent processing of the multidimensional signal.

4. The digital receiver of claim 3, wherein each sub-symbol before the slicer is represented by one sign bit, a first and a second magnitude bits and three fractional bits, and the encoder encodes each sub-symbol by extracting the sign bit, the second magnitude bit, and the three fractional bits to represent the encoded sub-symbol.

5. The digital receiver of claim 2, wherein the multidimensional signal includes a data part and a non-data part preceding the data part, and the pair swap and symbol alignment unit further comprising

a converter configured to convert each encoded sub-symbol in the non-data part of the multidimensional signal into binary format;

a non-data mode receiver coupled to the converter and configured to detect pair-swap and symbol misalignment in the multidimensional signal using the non-data part of the

multidimensional signal in binary format as received from the converter; and

a switchboard module coupled to the non-data mode receiver configured to correct pair-swap and symbol misalignment in the multidimensional signal based on information regarding pair-swap and symbol misalignment in the multidimensional signal as detected by the non-data mode receiver.

6. The digital receiver of claim 5, wherein the non-data mode receiver detects pair-swap and symbol misalignment in the multidimensional signal by serially comparing selected bits from each dimension of the non-data part of the multidimensional signal with a set of scrambler coefficients.

7. The digital receiver of claim 5, wherein the switchboard module corrects pair-swap and symbol misalignment in the multidimensional signal by performing symbol alignment and pair-swap reordering operations in one pass.

8. The digital receiver of claim 5, wherein the switchboard module operates in a verification mode and in a switching mode, verifies that

information regarding pair-swap and symbol misalignment detected by the non-data mode receiver is correct in the verification mode, and corrects pair-swap and symbol misalignment in the multidimensional signal in the switching mode.